



Great Lakes Water Supply Program
Annual Operations and Maintenance Cost Summary
February 2018
DRAFT



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FACILITY	ANNUAL COSTS (June 2017 ENR CCI = 10,942)					TOTALS
	ELECTRIC	CHEMICAL	GAS	MAINTENANCE	REPLACEMENT	
Existing Facilities						
Facilities Total Current Cost	\$ 764,900	\$ 201,600	\$ 7,700	\$ 0	\$ 0	\$ 974,200
Anticipated Cost Reduction	\$ (671,900)	\$ (141,100)	\$ 0	\$ 0	\$ 0	\$ (813,000)
Subtotal	\$ 93,000	\$ 60,500	\$ 7,700	\$ 0	\$ 0	\$ 161,200
Program Facilities						
Booster Pumping Station	\$ 154,000	\$ 93,900	\$ 4,000	\$ 265,500	\$ 140,400	\$ 657,800
Water Supply Control Building	\$ 1,000	\$ 0	\$ 1,400	\$ 20,700	\$ 14,100	\$ 37,200
Return Flow Pumping Station	\$ 235,300	\$ 0	\$ 2,300	\$ 62,300	\$ 89,600	\$ 389,500
Return Flow Facilities and Outfall	\$ 3,200	\$ 0	\$ -	\$ 71,300	\$ 1,200	\$ 75,700
Water Supply Pipeline	\$ 0	\$ 0	\$ 0	\$ 37,200	\$ 17,500	\$ 54,700
Return Flow Pipeline	\$ 0	\$ 0	\$ 0	\$ 72,100	\$ 38,300	\$ 110,400
Subtotal	\$ 393,500	\$ 93,900	\$ 7,700	\$ 529,100	\$ 301,100	\$ 1,325,300
Annual Total	\$ 486,500	\$ 154,400	\$ 15,400	\$ 529,100	\$ 301,100	\$ 1,486,500
20-year NPV	\$ 6,138,400	\$ 1,948,100	\$ 194,300	\$ 6,675,900	\$ 3,799,100	\$ 18,755,800

Notes:

1. NPV: Gradient Series, 8% Discount Rate, 3% Inflation factor based on WDNR guidance on monetary analysis which includes specifying a 20 year planning period.
2. Estimated Electrical Unit Costs: \$0.08/kWh.
3. Gas Unit Cost: \$0.06/therm.
4. Electrical Power Costs and cost reduction provided by WWU on January 9, 2018. Costs are based on averages for years 2015-2017 dollars (average ENR CCI = 10,284) and adjusted to June 2017 dollars (ENR CCI = 10,942).
5. Chemical cost reduction based on 70% reduced chemical use at existing facilities.



Great Lakes Water Supply Program
Existing Facilities
Electric Power Costs
February 2018



Annual Operations and Maintenance Cost Summary

FACILITY	COSTS	
	ANNUAL COSTS	20-yr NPV
Well 2		
All Equipment	\$ 1,283	\$ 16,200
Well 3		
All Equipment	\$ 66,667	\$ 841,200
Well 5		
All Equipment	\$ 11,213	\$ 141,500
Well 6		
All Equipment	\$ 25,219	\$ 318,200
Well 7		
All Equipment	\$ 12,557	\$ 158,400
Well 8		
All Equipment	\$ 126,512	\$ 1,596,300
Treatment Building	\$ 0	\$ 0
Well 9		
All Equipment	\$ 24,795	\$ 312,900
Well 10		
All Equipment	\$ 360,585	\$ 4,549,700
Well 11 & 12		
All Equipment	\$ 22,228	\$ 280,500
Well 13		
All Equipment	\$ 39,272	\$ 495,500
Airport Booster Station		
All Equipment	\$ 2,758	\$ 34,800
Hillcrest Booster Station		
All Equipment	\$ 3,860	\$ 48,700
Madison Booster Station		
All Equipment	\$ 36,549	\$ 461,200
Oakmont Booster Station		
All Equipment	\$ 3,893	\$ 49,100
Stardust Booster Station		
All Equipment	\$ 3,601	\$ 45,400



**Great Lakes Water Supply Program
Existing Facilities
Electric Power Costs
February 2018**



Annual Operations and Maintenance Cost Summary

FACILITY	COSTS	
	ANNUAL COSTS	20-yr NPV
Woodridge Booster Station		
All Equipment	\$ 4,265	\$ 53,800
Southeast Highline Booster Station		
All Equipment	\$ 9,239	\$ 116,600
River Valley Booster Station		
All Equipment	\$ 2,020	\$ 25,500
Lodge PRV		
All Equipment	\$ 568	\$ 7,200
Hillcrest Reservoir		
All Equipment	\$ 312	\$ 3,900
Evergreen Tower		
All Equipment	\$ 319	\$ 4,000
Davidson Tower		
All Equipment	\$ 711	\$ 9,000
Hunter Tower		
All Equipment	\$ 1,027	\$ 13,000
Morris Tower		
All Equipment	\$ 1,512	\$ 19,100
Meadowbrook Tower		
All Equipment	\$ 1,697	\$ 21,400
UWW Tower		
All Equipment	\$ 1,447	\$ 18,300
West Avenue Chemical Storage		
All Equipment	\$ 642	\$ 8,100
Newhill Storage Building		
All Equipment	\$ 152	\$ 1,900

TOTALS = \$ 764,900 \$ 9,651,400

Notes:

1. NPV: Gradient Series, 8% Discount Rate, 3% Inflation factor based on WDNR guidance on monetary analysis which includes specifying a 20 year planning period.
2. Electrical Power Costs provided by WWU on January 9, 2018. Costs are based on averages for years 2015-2017 dollars (average ENR CCI = 10,284) and adjusted to June 2017 dollars (ENR CCI = 10,942).



Great Lakes Water Supply Program
Existing Facilities
Chemical Use Costs
February 2018



Annual Operations and Maintenance Cost Summary

FACILITY	CHEMICAL			COSTS	
	GALLON / MONTH	COST / GALLON	COST / MONTH	ANNUAL COSTS	20-yr NPV
All Facilities					
Chlorine, Sodium Silicate, Fluoride	NA	NA	NA	\$ 201,600	\$ 2,538,100
TOTALS = \$ 201,600 \$ 2,538,100					

Notes:

1. NPV: Gradient Series, 8% Discount Rate, 3% Inflation factor based on WDNR guidance on monetary analysis which includes specifying a 20 year planning period.
2. Chemical Use Annual Cost provided by WWU on January 9, 2018 that reflects cost for 2017.



Great Lakes Water Supply Program
Existing Facilities
Natural Gas Use Costs
February 2018



Annual Operations and Maintenance Cost Summary

FACILITY		COSTS	
		ANNUAL COSTS	20-yr NPV
Well 2			
	All Equipment	\$ 0	\$ 0
Well 3			
	All Equipment	\$ 1,074	\$ 13,600
Well 5			
	All Equipment	\$ 0	\$ 0
Well 6			
	All Equipment	\$ 513	\$ 6,500
Well 7			
	All Equipment	\$ 0	\$ 0
Well 8			
	All Equipment	\$ 472	\$ 6,000
	Treatment Building	\$ 196	\$ 2,500
Well 9			
	All Equipment	\$ 488	\$ 6,200
Well 10			
	All Equipment	\$ 780	\$ 9,800
Well 11 & 12			
	All Equipment	\$ 164	\$ 2,100
Well 13			
	All Equipment	\$ 443	\$ 5,600
Airport Booster Station			
	All Equipment	\$ 849	\$ 10,700
Hillcrest Booster Station			
	All Equipment	\$ 431	\$ 5,400
Madison Booster Station			
	All Equipment	\$ 246	\$ 3,100
Oakmont Booster Station			
	All Equipment	\$ 356	\$ 4,500
Stardust Booster Station			
	All Equipment	\$ 249	\$ 3,100
Woodridge Booster Station			
	All Equipment	\$ 328	\$ 4,100



**Great Lakes Water Supply Program
Existing Facilities
Natural Gas Use Costs
February 2018**



Annual Operations and Maintenance Cost Summary

FACILITY	COSTS	
	ANNUAL COSTS	20-yr NPV
Southeast Highline Booster Station		
All Equipment	\$ 230	\$ 2,900
River Valley Booster Station		
All Equipment	\$ 0	\$ 0
Lodge PRV		
All Equipment	\$ 0	\$ 0
Hillcrest Reservoir		
All Equipment	\$ 0	\$ 0
Evergreen Tower		
All Equipment	\$ 0	\$ 0
Davidson Tower		
All Equipment	\$ 0	\$ 0
Hunter Tower		
All Equipment	\$ 0	\$ 0
Morris Tower		
All Equipment	\$ 0	\$ 0
Meadowbrook Tower		
All Equipment	\$ 132	\$ 1,700
UWW Tower		
All Equipment	\$ 0	\$ 0
West Avenue Chemical Storage		
All Equipment	\$ 507	\$ 6,400
Newhill Storage Building		
All Equipment	\$ 233	\$ 2,900

TOTALS = \$ 7,700 \$ 97,100

Notes:

1. NPV: Gradient Series, 8% Discount Rate, 3% Inflation factor based on WDNR guidance on monetary analysis which includes specifying a 20 year planning period.
2. Natural Gas Use Costs provided by WWU on January 9, 2018. Costs are based on averages for years 2015-2017 dollars (average ENR CCI = 10,284) and adjusted to June 2017 dollars (ENR CCI = 10,942).



**Great Lakes Water Supply Program
Program Facilities
Electric Power Costs
February 2018**



Annual Operations and Maintenance Cost Summary

FACILITY	EQUIPMENT					COSTS	
	NO. OPERATING	HP	HR/DAY (EACH)	kWh/DAY (TOTAL)	kWh/YR	ANNUAL COSTS	20-yr NPV
Booster Pumping Station							
Process Equipment							
Jockey Pump	1	95	1	71.0	25,902	\$ 2,072	\$ 26,100
High Duty Pumps	1	205	23.0	3,522.1	1,285,568	\$ 102,845	\$ 1,297,700
Sodium Hypochlorite Feed Pumps	1	0.2	24	2.8	1,026	\$ 82	\$ 1,000
Ammonia Feed Pumps	1	0.2	24	2.8	1,026	\$ 82	\$ 1,000
Corrosion Inhibitor Feed Pumps	1	0.5	24	9.0	3,272	\$ 262	\$ 3,300
Sump Pumps / Ejector Pits	1	10	0.5	3.7	1,363	\$ 109	\$ 1,400
Reservoir Mixing System	2	7.5	0.5	5.6	2,045	\$ 164	\$ 2,100
Electrical Equipment							
Switchgear Room Equipment	1	45	24	806.8	294,467	\$ 23,557	\$ 297,200
Battery Room Equipment	1	2	24	28.1	10,258	\$ 821	\$ 10,400
Lighting	1	12	1	9.0	3,272	\$ 262	\$ 3,300
Mechanical Equipment							
Make-up Air Units / DX Split / AC	1	15	8	89.6	32,719	\$ 2,617	\$ 33,000
Unit Heaters	6	5	12	268.9	98,156	\$ 7,852	\$ 99,100
Air Handling Units / DX Split / AC	2	15	16	358.6	130,874	\$ 10,470	\$ 132,100
Exhaust Air Fans	9	1	12	80.7	29,447	\$ 2,356	\$ 29,700
Plumbing Equipment							
Duplex Sump Pump	1	10	1	7.5	2,727	\$ 218	\$ 2,800
Booster Pumps	1	2	4	6.0	2,181	\$ 174	\$ 2,200
Fire Protection							
Jockey Pump	1	2	1	1.5	545	\$ 44	\$ 600
Fire Pump	1	75	0.5	28.0	28	\$ 2	\$ 28
					SUBTOTAL	\$ 154,000	\$ 1,943,000
Water Supply Control Building							
Electrical Equipment							
Panelboards	2	0.4	24	14.4	5,256	\$ 420	\$ 5,300
Lighting	1	0.8	1	0.6	215	\$ 17	\$ 200
Mechanical Equipment							
Exhaust Air Fans	2	1	12	17.9	6,544	\$ 523	\$ 6,600
					SUBTOTAL	\$ 1,000	\$ 12,100
Return Flow Pumping Station							
Process Equipment							
Return Flow Pump	2	161	24	7,171.2	2,617,488	\$ 209,399	\$ 2,642,100
Electrical Equipment							
MCC & VFDs	1	70	8	418.3	152,687	\$ 12,215	\$ 154,100
Lighting	1	2	1	1.6	571	\$ 46	\$ 600
Mechanical Equipment							
Self-contained DX RTU / AC	2	15	16	358.6	130,874	\$ 10,470	\$ 132,100
Unit Heaters	2	5	12	89.6	32,719	\$ 2,617	\$ 33,000
Exhaust Air Fans	2	1	12	17.9	6,544	\$ 523	\$ 6,600
					SUBTOTAL	\$ 235,300	\$ 2,968,500
Return Flow Facilities and Outfall							
Electrical Equipment							
Autosampler	1	0.4	24	7.2	2,628	\$ 210	\$ 2,700
PLC	1	0.2	1	0.1	55	\$ 4	\$ 100
Lighting	1	0.02	1	0.01	5	\$ 0	\$ -
Mechanical Equipment							
Self-contained DX System / AC	1	2	8	12.0	4,362	\$ 349	\$ 4,400
Unit Heaters	1	5	12	89.6	32,719	\$ 2,617	\$ 33,000
					SUBTOTAL	\$ 3,200	\$ 40,200

TOTALS = \$ 393,500 \$ 4,963,800

Notes:

1. NPV: Gradient Series, 8% Discount Rate, 3% Inflation factor based on WDNR guidance on monetary analysis which includes specifying a 20 year planning period.
2. Estimated Electrical Costs: \$.08/kWh
3. Pumps operating at ADD of 6.6 MGD at Booster Pumping Station, Return Flow Pumping Station Pumps at 6.6 MGD



Great Lakes Water Supply Program
Program Facilities
Chemical Use Costs
February 2018



Annual Operations and Maintenance Cost Summary

FACILITY	CHEMICAL			COSTS	
	GALLON / MONTH	COST / GALLON	COST / MONTH	ANNUAL COSTS	20-yr NPV
Booster Pumping Station					
Sodium Hypochlorite	4,600	\$ 1.00	\$ 4,600	\$ 55,200	\$ 696,500
Liquid ammonium sulfate	1,500	\$ 1.25	\$ 1,875	\$ 22,500	\$ 283,900
Blended phosphate	900	\$ 1.50	\$ 1,350	\$ 16,200	\$ 204,400
			\$ 7,700.00		
TOTALS =				\$ 93,900	\$ 1,184,800

Notes:

1. NPV: Gradient Series, 8% Discount Rate, 3% Inflation factor based on WDNR guidance on monetary analysis which includes specifying a 20 year planning period.
2. Based on ADD of 6.6 MGD at Booster Pumping Station.
3. Pipe loop testing results will finalize the type and dosage of chemical used.
4. It is assumed that fluoride and chemical pH adjustment will not be required.



Great Lakes Water Supply Program
Program Facilities
Natural Gas Use Costs
February 2018



Annual Operations and Maintenance Cost Summary

FACILITY	NATURAL GAS			COSTS	
	THERMS / MONTH	COST / THERM	COST / MONTH	ANNUAL COSTS	20-yr NPV
Booster Pumping Station					
Therms	5,500	\$ 0.06	\$ 330	4,000	\$ 50,500
Water Supply Control Building					
Therms	2,000	\$ 0.06	\$ 120	1,400	\$ 17,700
Return Flow Pumping Station					
Therms	3,200	\$ 0.06	\$ 192	2,300	\$ 29,000
Standby Generator	315	\$ 0.06	\$ 19	227	\$ 2,900
Return Flow Facilities and Outfall					
		\$ 0.06	\$ -	-	-
TOTALS =				\$ 7,900	\$ 100,100

Notes:

1. NPV: Gradient Series, 8% Discount Rate, 3% Inflation factor based on WDNR guidance on monetary analysis which includes specifying a 20 year planning period.
2. Booster Pumping Station Calculations per IECC 2009, modeled in Trace700.
3. Water Supply Control Building, Return Flow Pumping Station, and Return Flow Control Building natural gas use calculations were based on heat loss per unit area or volume.
4. Assumed generator runtime of 63h/year: 52 weekly tests @ 1h, 1 annual load test @ 8h, 3h utility downtime (per 2016 Energy Information Administration data).



**Great Lakes Water Supply Program
Program Facilities
Maintenance Costs
February 2018**



Annual Operations and Maintenance Cost Summary

FACILITY / TASK		EQUIPMENT, MATERIALS AND CONSUMABLES	FREQUENCY (D, W, M, Q, SA, A)	LABOR			COSTS		
				HR/ OCCURRENCE	HR/YEAR	\$/HR	\$/YEAR	ANNUAL COSTS	20 yr-NPV
Booster Pumping Station									
	Site Maintenance								
	Building Inspection	\$ 0	A	12.0	12.0	\$ 100	\$ 1,200	\$ 1,200	\$ 15,100
	Ground keeping (maintenance contract)	\$ 0	A	12.0	12.0	\$ 100	\$ 1,200	\$ 1,200	\$ 15,100
	Snow Removal	\$ 0	A	16.0	16.0	\$ 120	\$ 1,920	\$ 1,920	\$ 24,200
	Internal road maintenance (maintenance contract)	\$ 0	SA	12.0	24.0	\$ 100	\$ 2,400	\$ 2,400	\$ 30,300
	Building / General								
	Building Inspection	\$ 0	A	8.0	8.0	\$ 120	\$ 960	\$ 960	\$ 12,100
	Janitorial Work	\$ 0	M	2.0	24.0	\$ 120	\$ 2,880	\$ 2,880	\$ 36,300
	Tuckpointing (maintenance contract)	\$ 0	A	4.0	4.0	\$ 100	\$ 400	\$ 400	\$ 5,000
	Door Hardware Maintenance	\$ 0	A	8.0	8.0	\$ 120	\$ 960	\$ 960	\$ 12,100
	Lighting	\$ 0	A	34.0	34.0	\$ 120	\$ 4,080	\$ 4,080	\$ 51,500
	Sealant Replacement at Openings	\$ 0	A	4.0	4.0	\$ 120	\$ 480	\$ 480	\$ 6,100
	Window Washing	\$ 0	A	8.0	8.0	\$ 120	\$ 960	\$ 960	\$ 12,100
	Roof Drainage Cleaning	\$ 0	Q	8.0	32.0	\$ 120	\$ 3,840	\$ 3,840	\$ 48,500
	Painting - Interior Finishes	\$ 0	A	8.0	8.0	\$ 120	\$ 960	\$ 960	\$ 12,100
	Painting - Process Piping	\$ 0	A	8.0	8.0	\$ 120	\$ 960	\$ 960	\$ 12,100
	Sewer Use Fees	\$ 2,615	A	0.0	0.0	\$ 0	\$ 0	\$ 2,615	\$ 32,900
	Process Equipment								
	BPS process daily inspection, record keeping	\$ 0	D	3.0	783.0	\$ 120	\$ 93,960	\$ 93,960	\$ 1,185,500
	Booster Pumps	\$ 0	SA	24.0	48.0	\$ 120	\$ 5,760	\$ 5,760	\$ 72,700
	Valves - Annual Exercising	\$ 0	A	100.0	100.0	\$ 120	\$ 12,000	\$ 12,000	\$ 151,400
	Bridge Crane - third party annual testing (maintenance contract)	\$ 1,600	A	0.0	0.0	\$ 0	\$ 0	\$ 1,600	\$ 20,200
	Reservoir - NA								
	Electrical Equipment								
	Switchgear Inspection	\$ 0	Q	12.0	48.0	\$ 120	\$ 5,760	\$ 5,760	\$ 72,700
	Switchgear Breaker Test	\$ 0	A	24.0	24.0	\$ 120	\$ 2,880	\$ 2,880	\$ 36,300
	Generator Testing	\$ 0	W	2.0	104.0	\$ 120	\$ 12,480	\$ 12,480	\$ 157,500
	Generator Operation	\$ 23,200	A	0.0	0.0	\$ 0	\$ 0	\$ 23,200	\$ 292,100
	Emergency Lighting Test	\$ 0	M	4.0	48.0	\$ 120	\$ 5,760	\$ 5,760	\$ 72,700
	General Lighting Clean & Inspect	\$ 0	Q	4.0	16.0	\$ 120	\$ 1,920	\$ 1,920	\$ 24,200
	Instrumentation and Controls								
	Overall Maintenance	\$ 25,000	A	0.0	0.0	\$ 0	\$ 0	\$ 25,000	\$ 315,400
	Mechanical Equipment								
	Make-up Air Units / DX Split /AC	\$ 0	A	8.0	8.0	\$ 120	\$ 960	\$ 960	\$ 12,100
	Unit Heaters	\$ 0	A	38.0	38.0	\$ 120	\$ 4,560	\$ 4,560	\$ 57,500
	Air Handling Units / DX Split /AC	\$ 0	A	16.0	16.0	\$ 120	\$ 1,920	\$ 1,920	\$ 24,200



Great Lakes Water Supply Program
Program Facilities
Maintenance Costs
February 2018



Annual Operations and Maintenance Cost Summary

FACILITY / TASK	EQUIPMENT, MATERIALS AND CONSUMABLES	FREQUENCY (D, W, M, Q, SA, A)	LABOR				COSTS	
			HR/ OCCURRENCE	HR/YEAR	\$/HR	\$/YEAR	ANNUAL COSTS	20 yr-NPV
Lighting	\$ 0	A	0.8	0.8	\$ 120	\$ 95	\$ 95	\$ 1,200
Filters	\$ 0	Q	4.0	16.0	\$ 120	\$ 1,920	\$ 1,920	\$ 24,200
Exhaust Air Fans	\$ 0	A	33.0	33.0	\$ 120	\$ 3,960	\$ 3,960	\$ 50,000
Dampers and Controls	\$ 0	A	16.0	16.0	\$ 120	\$ 1,920	\$ 1,920	\$ 24,200
Plumbing								
Water Heaters	\$ 0	A	4.0	4.0	\$ 120	\$ 480	\$ 480	\$ 6,100
Duplex Sump Pump	\$ 0	A	8.0	8.0	\$ 120	\$ 960	\$ 960	\$ 12,100
Booster Pumps	\$ 0	A	8.0	8.0	\$ 120	\$ 960	\$ 960	\$ 12,100
Fire Protection								
Fire Pump	\$ 0	W	2.0	104.0	\$ 120	\$ 12,480	\$ 12,480	\$ 157,500
Jockey Pump	\$ 0	W	0.5	26.0	\$ 120	\$ 3,120	\$ 3,120	\$ 39,400
Lighting	\$ 0	W	2.0	104.0	\$ 120	\$ 12,480	\$ 12,480	\$ 157,500
Controls	\$ 0	W	0.5	26.0	\$ 120	\$ 3,120	\$ 3,120	\$ 39,400
Sprinklers (maintenance contract)	\$ 400	A	0.0	0.0	\$ 0	\$ 0	\$ 400	\$ 5,000
						SUBTOTAL	\$ 265,500	\$ 3,348,700



**Great Lakes Water Supply Program
Program Facilities
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Annual Operations and Maintenance Cost Summary

FACILITY / TASK		EQUIPMENT, MATERIALS AND CONSUMABLES	FREQUENCY (D, W, M, Q, SA, A)	LABOR				COSTS	
				HR/ OCCURRENCE	HR/YEAR	\$/HR	\$/YEAR	ANNUAL COSTS	20 yr-NPV
Water Supply Control Building									
	Site Maintenance - N/A, within existing site								
	Building / General								
	Building Inspection	\$ 0	A	1.0	1.0	\$ 120	\$ 120	\$ 120	\$ 1,500
	Tuckpointing (maintenance contract)	\$ 0	A	1.0	1.0	\$ 100	\$ 100	\$ 100	\$ 1,300
	Door Hardware Maintenance	\$ 0	A	1.0	1.0	\$ 120	\$ 120	\$ 120	\$ 1,500
	Sealant Replacement at Openings	\$ 0	A	1.0	1.0	\$ 120	\$ 120	\$ 120	\$ 1,500
	Roof Drainage Cleaning	\$ 0	Q	1.0	4.0	\$ 120	\$ 480	\$ 480	\$ 6,100
	Painting - Interior Finishes	\$ 0	A	0.5	0.5	\$ 120	\$ 60	\$ 60	\$ 800
	Lighting	\$ 0	W	2.2	115.6	\$ 120	\$ 13,875	\$ 13,875	\$ 175,100
	Painting - Process Piping	\$ 0	A	0.5	0.5	\$ 120	\$ 60	\$ 60	\$ 800
	Process Equipment								
	Valves, exercise and testing	\$ 0	A	8.0	8.0	\$ 120	\$ 960	\$ 960	\$ 12,100
	Electrical Equipment								
	Panelboard Inspection	\$ 0	A	2.0	2.0	\$ 120	\$ 240	\$ 240	\$ 3,000
	Emergency Lighting Test	\$ 0	M	1.0	12.0	\$ 120	\$ 1,440	\$ 1,440	\$ 18,200
	General Lighting Clean & Inspect	\$ 0	Q	1.0	4.0	\$ 120	\$ 480	\$ 480	\$ 6,100
	Mechanical Equipment								
	Unit Heaters	\$ 0	A	8.0	8.0	\$ 120	\$ 960	\$ 960	\$ 12,100
	Exhaust Air Fans	\$ 0	A	6.0	6.0	\$ 120	\$ 720	\$ 720	\$ 9,100
	Dampers and Controls	\$ 0	A	8.0	8.0	\$ 120	\$ 960	\$ 960	\$ 12,100
							SUBTOTAL	\$ 20,700	\$ 261,300
Return Flow Pumping Station									
	Site Maintenance - N/A, assigned to CWP								
	Building / General								
	Building Inspection	\$ 0	A	1.0	1.0	\$ 120	\$ 120	\$ 120	\$ 1,500
	Tuckpointing (maintenance contract)	\$ 0	A	1.0	1.0	\$ 100	\$ 100	\$ 100	\$ 1,300
	Door Hardware Maintenance	\$ 0	A	1.0	1.0	\$ 120	\$ 120	\$ 120	\$ 1,500
	Sealant Replacement at Openings	\$ 0	A	1.0	1.0	\$ 120	\$ 120	\$ 120	\$ 1,500
	Roof Drainage Cleaning	\$ 0	Q	1.0	4.0	\$ 120	\$ 480	\$ 480	\$ 6,100
	Painting - Interior Finishes	\$ 0	A	0.5	0.5	\$ 120	\$ 60	\$ 60	\$ 800
	Painting - Process Piping	\$ 0	A	0.5	0.5	\$ 120	\$ 60	\$ 60	\$ 800
	Process Equipment								
	Return Flow Pumps	\$ 0	D	0.7	174.0	\$ 120	\$ 20,880	\$ 20,880	\$ 263,500
	Return Flow Pumps	\$ 0	SA	16.0	32.0	\$ 120	\$ 3,840	\$ 3,840	\$ 48,500
	Valves	\$ 0	A	20.0	20.0	\$ 120	\$ 2,400	\$ 2,400	\$ 30,300
	Sluice Gates	\$ 0	A	4.0	4.0	\$ 120	\$ 480	\$ 480	\$ 6,100
	Process piping painting	\$ 0	A	16.0	16.0	\$ 120	\$ 1,920	\$ 1,920	\$ 24,200



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Program Facilities
Maintenance Costs
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Annual Operations and Maintenance Cost Summary

FACILITY / TASK	EQUIPMENT, MATERIALS AND CONSUMABLES	FREQUENCY (D, W, M, Q, SA, A)	LABOR				COSTS	
			HR/ OCCURRENCE	HR/YEAR	\$/HR	\$/YEAR	ANNUAL COSTS	20 yr-NPV
Electrical Equipment								
MCC Inspection	\$ 0	Q	8.0	32.0	\$ 120	\$ 3,840	\$ 3,840	\$ 48,500
MCC Breaker Test	\$ 0	A	12.0	12.0	\$ 120	\$ 1,440	\$ 1,440	\$ 18,200
Generator Testing	\$ 0	W	1.0	52.0	\$ 120	\$ 6,240	\$ 6,240	\$ 78,700
Generator Operation	\$ 9,900	A	0.0	0.0	\$ 0	\$ 0	\$ 9,900	\$ 124,600
Emergency Lighting Test	\$ 0	M	1.0	12.0	\$ 120	\$ 1,440	\$ 1,440	\$ 18,200
General Lighting Clean & Inspect	\$ 0	Q	2.0	8.0	\$ 120	\$ 960	\$ 960	\$ 12,100
Mechanical Equipment								
Self-contained DX RTU /AC	\$ 0	A	16.0	16.0	\$ 120	\$ 1,920	\$ 1,920	\$ 24,200
Unit Heaters	\$ 0	A	12.0	12.0	\$ 120	\$ 1,440	\$ 1,440	\$ 18,200
Exhaust Air Fans	\$ 0	A	6.0	6.0	\$ 120	\$ 720	\$ 720	\$ 9,100
Dampers and Controls	\$ 0	A	16.0	16.0	\$ 120	\$ 1,920	\$ 1,920	\$ 24,200
Filters	\$ 0	Q	4.0	16.0	\$ 120	\$ 1,920	\$ 1,920	\$ 24,200
						SUBTOTAL	\$ 62,300	\$ 786,300
Return Flow Facilities and Outfall								
Sampling and Maintenance								
Sampling	\$ 0	D	2.0	522.0	\$ 120	\$ 62,640	\$ 62,640	\$ 790,400
Maintenance	\$ 0	M	4.0	48.0	\$ 120	\$ 5,760	\$ 5,760	\$ 72,700
Electrical Equipment								
Emergency Lighting Test	\$ 0	M	0.5	6.0	\$ 120	\$ 720	\$ 720	\$ 9,100
General Lighting Clean & Inspect	\$ 0	Q	0.5	2.0	\$ 120	\$ 240	\$ 240	\$ 3,000
Mechanical Equipment								
Self-contained DX RTU /AC	\$ 0	A	8.0	8.0	\$ 120	\$ 960	\$ 960	\$ 12,100
Unit Heaters	\$ 0	A	8.0	8.0	\$ 120	\$ 960	\$ 960	\$ 12,100
						SUBTOTAL	\$ 71,300	\$ 899,400
Water Supply Pipeline								
Site Maintenance - N/A								
Building / General - N/A								
Process Equipment								
Exercise Air Valve Assemblies	\$ 0	A	33.0	39.0	\$ 120	\$ 4,680	\$ 4,680	\$ 59,100
Exercise Isolation Valves	\$ 0	A	18.0	18.0	\$ 120	\$ 2,160	\$ 2,160	\$ 27,300
Exercise Blowoff Assemblies	\$ 0	A	33.0	39.0	\$ 120	\$ 4,680	\$ 4,680	\$ 59,100
Pipeline Flushing	\$ 0	A	38.0	38.0	\$ 120	\$ 4,560	\$ 4,560	\$ 57,500
Corrosion Control Testing	\$ 11,110	A	0.0	0.0	\$ 0	\$ 0	\$ 11,110	\$ 140,200



**Great Lakes Water Supply Program
Program Facilities
Maintenance Costs
February 2018**



Annual Operations and Maintenance Cost Summary

FACILITY / TASK	EQUIPMENT, MATERIALS AND CONSUMABLES	FREQUENCY (D, W, M, Q, SA, A)	LABOR				COSTS	
			HR/ OCCURRENCE	HR/YEAR	\$/HR	\$/YEAR	ANNUAL COSTS	20 yr-NPV
Electrical Equipment -N/A								
Mechanical Equipment - N/A								
Utility Locating Services	\$ 10,000	A	0.0	0.0	\$ 0	\$ 0	\$ 10,000	\$ 126,200
						SUBTOTAL	\$ 37,200	\$ 469,400
Return Flow Pipeline								
Site Maintenance -N/A								
Building / General -N/A								
Process Equipment								
Exercise Air Valve Assemblies	\$ 0	A	72.0	72.0	\$ 120	\$ 8,640	\$ 8,640	\$ 109,000
Exercise Isolation Valves	\$ 0	A	36.0	36.0	\$ 120	\$ 4,320	\$ 4,320	\$ 54,500
Exercise Blowoff Assemblies	\$ 0	A	72.0	72.0	\$ 120	\$ 8,640	\$ 8,640	\$ 109,000
Pipeline Flushing	\$ 0	A	80.0	80.0	\$ 120	\$ 9,600	\$ 9,600	\$ 121,100
Corrosion Control Testing	\$ 25,920	A	0.0	0.0	\$ 0	\$ 0	\$ 25,920	\$ 296,700
Electrical Equipment -N/A								
Mechanical Equipment - N/A								
Utility Locating Services	\$ 15,000	A	0.0	0.0	\$ 0	\$ 0	\$ 15,000	\$ 189,300
						SUBTOTAL	\$ 72,100	\$ 879,600

TOTALS = \$ 457,800 \$ 5,745,300

Notes:

1. NPV: Gradient Series, 8% Discount Rate, 3% Inflation factor based on WDNR guidance on monetary analysis which includes specifying a 20 year planning period.
2. Frequency and hours based on manufacturers recommendation, industry standard reference manuals and engineers experience.
3. Corrosion control testing at five year interval.
4. Maintenance costs for the daily (D) frequency are based on five working days in a week.



Great Lakes Water Supply Program
Program Facilities
Replacement Costs
February 2018
DRAFT



FACILITY	DESCRIPTION	INTERVAL				NPV TOTALS
		5-Year	10-Year	15-Year	20-Year	
Booster Pumping Station	Process					
	Booster Pump Seals	\$ 15,840	\$ 15,840	\$ 15,840	\$ 15,840	
	Booster Pump Bearings	\$ 7,700	\$ 30,000	\$ 0	\$ 30,000	
	Booster Pumps (minor refurbishment, 25% of installed cost)	\$ 0	\$ 0	\$ 0	\$ 85,313	
	Booster Pump Motors (minor refurbishment, 25% of installed cost)	\$ 0	\$ 0	\$ 0	\$ 56,875	
	Chemical Feed Pumps (replacement of pumps)	\$ 0	\$ 80,000	\$ 0	\$ 80,000	
	Chemical tank scales	\$ 0	\$ 13,000	\$ 0	\$ 13,000	
	Miscellaneous Chemical Feed Costs	\$ 0	\$ 1,000	\$ 0	\$ 1,000	
	Valves (45 large valve, minor refurbishment, 10% of installed cost)	\$ 0	\$ 0	\$ 0	\$ 160,000	
	Equipment Removal Bridge Crane	\$ 0	\$ 0	\$ 0	\$ 4,150	
	Sanitary Lift Station Eqpt: Pumps, floats	\$ 0	\$ 10,000	\$ 0	\$ 10,000	
	Reservoir					
	Spray Cleaning Exterior	\$ 20,000	\$ 0	\$ 0	\$ 0	
	Painting	\$ 0	\$ 200,000	\$ 0	\$ 20,000	
	Reservoir Mixing System (20% of installed cost for every 5-yr)	\$ 0	\$ 0	\$ 0	\$ 31,250	
	Inspection	\$ 7,000	\$ 7,000	\$ 7,000	\$ 7,000	
	Maintenance (complete washout)	\$ 50,000	\$ 50,000	\$ 50,000	\$ 50,000	
	Instrumentation and Controls					
	Flow Meter, Venturi 30"	\$ 0	\$ 0	\$ 0	\$ 7,300	
	Field Instrumentation	\$ 0	\$ 0	\$ 0	\$ 175,000	
	Pump Protection Instrumentation	\$ 0	\$ 0	\$ 260,000	\$ 0	
	Auto Samplers	\$ 0	\$ 0	\$ 0	\$ 80,000	
	PLC System	\$ 0	\$ 200,000	\$ 0	\$ 200,000	
	Reservoir level sensor	\$ 0	\$ 5,000	\$ 0	\$ 5,000	
	SCADA	\$ 0	\$ 200,000	\$ 0	\$ 350,000	
	Electrical					
	Switchgear Circuit Breakers Refurbish	\$ 0	\$ 0	\$ 0	\$ 300,000	
	Pump Drives	\$ 0	\$ 0	\$ 0	\$ 228,000	
	Lighting Panel	\$ 0	\$ 0	\$ 0	\$ 10,000	
	Batteries for Switchgear	\$ 0	\$ 0	\$ 50,000	\$ 0	
	Mechanical					
	Make-up Air Units / DX Split / AC	\$ 0	\$ 0	\$ 0	\$ 58,000	
	Unit Heaters	\$ 0	\$ 0	\$ 52,000	\$ 0	
	Air Handling Units / DX Split / AC	\$ 0	\$ 0	\$ 0	\$ 146,000	
	Exhaust Air Fans	\$ 0	\$ 0	\$ 0	\$ 86,000	
	Dampers and Controls	\$ 0	\$ 0	\$ 0	\$ 16,000	
	Testing and Balancing	\$ 5,000	\$ 5,000	\$ 5,000	\$ 5,000	
	Plumbing					
	Water Heaters	\$ 0	\$ 4,000	\$ 0	\$ 4,000	
	Duplex Sump Pump	\$ 0	\$ 22,000	\$ 0	\$ 22,000	
	Plumbing Booster Pumps	\$ 0	\$ 0	\$ 0	\$ 15,000	
	Fire Protection	\$ 5,000	\$ 5,000	\$ 5,000	\$ 148,000	
	Subtotal	\$ 110,540	\$ 847,840	\$ 444,840	\$ 2,419,728	
	NPV	\$ 87,200	\$ 527,800	\$ 218,500	\$ 937,600	\$ 1,771,100
Water Supply Control Building	Process					
	Main valve diaphragm and disc	\$ 0	\$ 0	\$ 1,307	\$ 0	
	PRV	\$ 4,500	\$ 18,000	\$ 4,500	\$ 18,000	
	Isolation Valves	\$ 0	\$ 0	\$ 0	\$ 8,000	
	Instrumentation and Controls					
	Pressure Transmitters	\$ 0	\$ 29,000	\$ 0	\$ 29,000	
	PLC System	\$ 0	\$ 0	\$ 120,000	\$ 0	
	SCADA	\$ 0	\$ 50,000	\$ 0	\$ 50,000	
	Electrical					
	Panelboard	\$ 0	\$ 0	\$ 0	\$ 5,000	
	Mechanical					
	Unit Heaters	\$ 0	\$ 0	\$ 8,000	\$ 0	
	Exhaust Air Fans	\$ 0	\$ 0	\$ 0	\$ 4,000	
	Dampers and Controls	\$ 0	\$ 0	\$ 0	\$ 6,000	
	Testing and Balancing	\$ 1,000	\$ 1,000	\$ 1,000	\$ 1,000	
	Subtotal	\$ 5,500	\$ 98,000	\$ 134,807	\$ 121,000	
	NPV	\$ 4,300	\$ 61,000	\$ 66,200	\$ 46,900	\$ 178,400



Great Lakes Water Supply Program
Program Facilities
Replacement Costs
February 2018
DRAFT



FACILITY	DESCRIPTION	INTERVAL				NPV TOTALS
		5-Year	10-Year	15-Year	20-Year	
Return Flow Pumping Station	Process					
	Pump Seals and Bearings Offsite	\$ 20,000	\$ 20,000	\$ 20,000	\$ 20,000	
	Return Flow Pumps and Motors	\$ 0	\$ 0	\$ 0	\$ 100,000	
	Sluice Gates	\$ 0	\$ 0	\$ 0	\$ 0	
	8" to 18" Valves	\$ 0	\$ 0	\$ 0	\$ 40,000	
	Auto-Sampler (unlikely at RFPS)	\$ 0	\$ 0	\$ 0	\$ 0	
	Gantry Crane	\$ 0	\$ 0	\$ 0	\$ 1,000	
	Instrumentation and Controls					
	Field Instrumentation	\$ 0	\$ 0	\$ 0	\$ 260,000	
	Auto Samplers	\$ 0	\$ 0	\$ 0	\$ 0	
	Pump Protection Instr.	\$ 0	\$ 0	\$ 260,000	\$ 0	
	PLC System	\$ 0	\$ 280,000	\$ 0	\$ 280,000	
	SCADA	\$ 0	\$ 350,000	\$ 0	\$ 350,000	
	Electrical					
	MCC Breakers	\$ 0	\$ 0	\$ 0	\$ 50,000	
	Pump Drives	\$ 0	\$ 0	\$ 0	\$ 172,000	
	Batteries for Switchgear	\$ 0	\$ 0	\$ 50,000	\$ 0	
	Mechanical					
	Self-contained DX RTU	\$ 0	\$ 0	\$ 60,500	\$ 0	
	Unit Heaters	\$ 0	\$ 0	\$ 13,000	\$ 0	
	Exhaust Air Fans	\$ 0	\$ 0	\$ 0	\$ 30,000	
	Dampers and Controls	\$ 0	\$ 0	\$ 0	\$ 6,000	
	Testing and Balancing	\$ 2,000	\$ 2,000	\$ 2,000	\$ 2,000	
	Subtotal	\$ 22,000	\$ 652,000	\$ 405,500	\$ 1,311,000	
	NPV	\$ 17,400	\$ 405,900	\$ 199,200	\$ 508,000	\$ 1,130,500
Return Flow Facilities and Outfall	Instrumentation and Controls					
	Flow Meter, Venturi 18"	\$ 0	\$ 0	\$ 0	\$ 7,300	
	Auto Sampler	\$ 0	\$ 0	\$ 0	\$ 20,000	
	Electrical					
	Panelboard	\$ 0	\$ 0	\$ 0	\$ 5,000	
	Mechanical					
	Self-contained DX RTU	\$ 0	\$ 0	\$ 3,000	\$ 0	
	Unit Heaters	\$ 0	\$ 0	\$ 3,000	\$ 0	
	Subtotal	\$ 0	\$ 0	\$ 6,000	\$ 32,300	
	NPV	\$ 0	\$ 0	\$ 2,900	\$ 12,500	\$ 15,400
Water Supply Pipeline	Process					
	Air Valve Assemblies	\$ 33,000	\$ 33,000	\$ 33,000	\$ 220,000	
	Isolation Valves (Not included, 40 year lifecycle)	\$ 0	\$ 0	\$ 0	\$ 0	
	Blowoff Assemblies (Not included, 40 year lifecycle)	\$ 0	\$ 0	\$ 0	\$ 0	
	Test Station Replacement	\$ 22,900	\$ 22,900	\$ 22,900	\$ 22,900	
	Anode Replacement	\$ 25,200	\$ 0	\$ 0	\$ 0	
	Pipeline Replacement (Not included, repair or replacement anticipated after 40 years)	\$ 0	\$ 0	\$ 0	\$ 0	
	Subtotal	\$ 81,100	\$ 55,900	\$ 55,900	\$ 242,900	
	NPV	\$ 64,000	\$ 34,800	\$ 27,500	\$ 94,100	\$ 220,400
Return Flow Pipeline	Process					
	Air Valve Assemblies	\$ 72,000	\$ 72,000	\$ 72,000	\$ 480,000	
	Isolation Valves (Not included, 40 year lifecycle)	\$ 0	\$ 0	\$ 0	\$ 0	
	Blowoff Assemblies (Not included, 40 year lifecycle)	\$ 0	\$ 0	\$ 0	\$ 0	
	Test Station Replacement	\$ 50,600	\$ 50,600	\$ 50,600	\$ 50,600	
	Anode Replacement	\$ 55,900	\$ 0	\$ 0	\$ 0	
	Pipeline Replacement (Not included, repair or replacement anticipated after 40 years)	\$ 0	\$ 0	\$ 0	\$ 0	
	Subtotal	\$ 178,500	\$ 122,600	\$ 122,600	\$ 530,600	
	NPV	\$ 140,800	\$ 76,300	\$ 60,200	\$ 205,600	\$ 482,900

Total NPV \$ 3,783,300

Notes:

1. NPV: Gradient Series, 8% Discount Rate, 3% Inflation factor based on WDNR guidance on monetary analysis which includes specifying a 20 year planning period.
2. Each pipeline test station has ten 20 lb high potential magnesium anodes.
3. Battery backup system to maintain power to the switchgear during transition from grid to generator.